other and successively smaller clouds were formed directly under the first, having symmetrical and concentric outlines therewith, while the central vertical axis, which might be conceived as passing through the whole series, remained unchanged and fixed in space. This central fixity, too, of them all continued, together with the infinite smoothness of the outlines of all the smaller lower strata of cloud, although the largest and uppermost one visible to us began to put forth a variety of fringes of cirro-cumulous character; and, as tested by the spectroscope before sunset, all the lower smooth-rimmed clouds were remarkable for the large quantity of watery vapour they contained, and held fast too, for no rain fell. As sunset approached every one was gazing at the strange phenomenon of a cloud-congeries of most portentous size and absolute fixature above the trade-wind, probably also the anti-trade region; and after sunset the most gorgeous coloured illuminations through all the ranges of scarlet-red, red, crimson-red, ultra-red, and then dun-coloured and grey passed from member to member of the series, distinguishing the various heights of its strata one above the other; while the greatness of the general height was shown, even long after darkness had set in, by a faint lunar-like illumination of the northern outline of the whole. But by ten o'clock that began to fail, and the system of superposed clouds was beginning to contract on its central axis, and faded away, without leaving its place, before morning.

In so far we had been witnessing, though without any positive light of its own, a vertical series of disks of cloudy matter, extremely like the lower end of the successive, transverse, discous arrangements seen in a gas vacuum-tube of large dimensions, when the electric discharge from a powerful induction-coil is passing through it; and we were inevitably reminded thereby that the cosmical electric theory of M. Gaston Planté (of "secondary batteries or storage" fame) justifies an escape of the earth's interior electricity from time to time into planetary space, and more particularly to the sun.

Was there, however, in this case any symptom of the sun exciting, or calling for, any such discharge, and from this part of the earth?

The sun was undoubtedly in the Northern Tropic, and the highest northern declination for the year had just been reached; but for a fortnight or more past the solar spot manifestations had generally been weak, almost fading away. This I knew well, having taken a picture of the sun-spots every day (Sundays excepted) since I have been here. However, though the appearances were as poor as they well could be on June 21, 22, and 23, yet on Friday, June 24, there was a little improvement, some new, though small symptoms appearing in either solar tropic. On Saturday, June 25, these new features were confirmed and slightly increased. But what were they on Sunday, June 26, when the extraordinary cloud-arrangement was hanging so long above Madeira?

I, who am here merely as a private amateur in a different subject, know not; but on Monday morning, so early as 5h. 30m. a.m., I was astonished and delighted at the solar scene then presented. The spots first caught sight of on Friday were now well advanced and much developed; a new group with extensive double ramifications had also appeared in the same tropic nearer the equator; while finally, near the middle of the sun's disk in the south tropic, were two large spots, with connections extending over 60,000 miles in length of solar surface, and indicating more solar energy to have been thereby rapidly, if not suddenly, manifested within the last forty hours, than anything which I, at least, have witnessed for a very long time past.

PIAZZI SMYTH,
Astronomer-Royal for Scotland

Jones's Hotel, Quinka do Corvalho,
Funchal, Madeira, June 27

P.S.—The grand, and now circumpolar, comet was not neglected here on the same night.—P. S.

Carbonic Acid Gas not Free in Sea Water

IN a short paragraph in NATURE, vol. xxiv. p. 176, it is stated that Tornö, in the Norwegian Deep-Sea Expedition, had found "carbonic acid both in a gaseous and basic form."

For some time past I have doubted whether there was any free carbonic acid gas in the deep water where pressure should make its presence felt. Lately, in a paper to the Royal Microscopical Society, I have demonstrated that if there is any carbonic acid in the sea water at great depths, its dissolving action is not equal in rapidity and intensity to that exercised by a microscopic Thallophyte which bores into an bissolves sponge spicules from within. Moreover amongst deep sea deposits I find perfect organisms which have long been dead, which have been penetrated by parasites and covered here and there by foraminifera, and yet in exposed parts, the ornamentation is perfect. There is no evidence of erosion.

Now on carefully examining into Tornö's essay come to a different conclusion to the writer in NATURE, and I find that the able Scandinavian denies the existence of free carbonic acid in the sea.

The following notes, which I made in abstracting Tornö's "Chemi" of the Norwegian North Atlantic Expedition, Part II., may be interesting:—

The carbonic acid gas, driven off by the process of boiling sea water, when collected, varied in a most marked manner; it was always appreciable, and the quantity was sometimes large. The pressure was that of the atmosphere. Under different conditions, and when the gases were boiled out in a vacuum created by steam, and of course at a lower temperature, the quantity of carbonic acid gas was often *immeasurably small*. Moreover the quantity varied.

Jacobsen, by distillation, succeeded in expelling the whole amount of carbonic acid contained in a quarter litre of sea water, and found that North Sea water contained 100 mgr. per litre. The neutral carbonates in the residuary deposit contained about 10 mgr. per litre. Hence a very small proportion of the carbonic acid driven off by distillation, could have been present in bicarbonates. Vierthaler had asserted that the carbonic acid in sea water was got out of the bicarbonates by boiling.

If the carbonic acid is free and absorbed by the sea water in a free gaseous form, it is remarkable that it should not be more readily got. Jacobsen supposed that sea water has a peculiar property of retaining its carbonic acid, owing to the presence of the chloride of magnesia. Buchanan was led to believe that most of the salts were in some degree distinguished by the property of determining the retention of carbonic acid in the sea. He especially insisted on the importance of the sulphates, and asserted the mean amount of carbonic acid present in the waters of the Southern Seas to be 43·25 mgr. per litre.

Tornö, following Jacobsen, found the amount of carbonic acid gas present in the water of the track of the northern cruise of 1877 to be about 100 mgr. a litre, but got 12 mgr. per litre as a variation in the amount.

He was struck with the improbability that sea water should possess so remarkable a power of retaining mechanically one gas and exert no corresponding influence on others, and then he found that sea water had *an alkaline reaction*. He began to believe that some of the neutral carbonates had been decomposed during the boiling, and had evolved much of the carbonic acid gas.

He then proved by experiment that the saline mixture in sea water, on the temperature being raised to the boiling point, decomposed neutral carbonates, and that all previous experiments with the object of measuring the carbonic acid in the sea water had been faulty. He was influenced by some experiments on the determination of carbonic acid gas in mineral water, and applied the method to sea water.

He found the total amount of carbonic acid gas in a specimen to be 97 mgr. per litre, and the proportion forming neutral carbonates to average about 53 mgr. The difference, 44 mgr., cannot occur free as gas, but will unite with the carbonates to form bicarbonates. Hence Jacobsen's experiments could be explained on the assumption that sea water contains no trace of free carbonic acid, but as much as 53 mgr. per litre forming carbonates, and only 44 mgr. forming bicarbonates.

On page 35 he states: "*If we bear in mind that sea water is an alkaline fluid which does not contain the smallest trace of free carbonic acid.*"

What a comfort this must be to globigerina and coral reefs!

June 27 P. MARTIN DUNCAN

Symbolical Logic

I AM afraid I share the proverbial obtuseness of my countrymen in the matter of jokes. I really did not at first see the point of Mr. Venn's humorous suggestion that "an attitude of slight social repression" should be observed towards troublesome authors of new proposals. Now however that Mr. Venn has kindly pointed it out to me (see NATURE, vol. xxiv. p. 140), I see the joke perfectly and can laugh at it heartily.

As for the little parenthesis which offended me, I am sorry I noticed it, and hope Mr. Venn will forgive the passing irritation which it produced. What he means by the words "I knew that he was very anxious that the fact should be known," I do not quite understand; but the matter is too unimportant for further comment.

With regard to the "crowning triumph" quotation or misquotation, I can only congratulate Mr. Venn on the adroitness with which he eluded the dilemma in which I quite thought I should place him. In my simplicity I expected that he would answer *Yes* or *No* to my question; but Mr. Venn was not thus to be caught.

It is but fair to own that the critical remarks which I made on Mr. Venn's book in my last letter, though perfectly just as far as they go, are somewhat one-sided. As I only spoke of points on which he and I differ in opinion it could not well be otherwise. His book contains much other matter which I did not touch upon at all, and of which I entertain a very high opinion. His diagrammatic method especially is most ingenious, and his exposition of it is lucid and attractive. The limits of its application in actual practice are, as he himself points out, rather narrow; but within those limits, and for purposes of illustration and verification, it is undoubtedly an important contribution to the science of logic. HUGH MCCOLL

Boulogne-sur-Mer, July 2

How to Prevent Drowning

THOSE who have followed the correspondence commenced in NATURE by Dr. MacCormac may be interested in the following extract from an essay, "Pourquoi les Bêtes nagent naturellement," which occurs oddly enough in a book entitled "Observations sur les Plantes et leur Analogie avec les Insectes," published at Strasburg in 1741 by Guido Augustin Bazin, a physician of that place:—

"Lorsqu'un homme qui n'a point appris à nager tombe dans l'eau, il n'y a point de doute que s'il pouvoit tenir son corps dans une position verticale et fixe, et porter ses jambes en avant, comme il fait lorsqu'il marche sur la terre, il ne pût nager naturellement aussi bien que, les bêtes, les habiles nageurs le font souvent pour leur plaisir. Nous connoissons un peuple entier qui ne nage pas autrement, ce sont les Hottentots; voici ce qu'en dit Mr. Kolbe, dans une bonne description qu'il nous a donnée du Cap de bonne Espérance:—"Aussi faut-il avouer qu'ils (les Hottentots) sont les meilleurs et les plus hardis nageurs que j'aye jamais vû. Leur manière de nager a même quelque chose de frappant, et je ne sçache pas qu'aucune nation s'y prenne de la même façon. Ils nagent tout droits; leur col est entièrement hors de l'eau, aussi bien que leurs bras, qu'ils étendent en haut; ils se servent des pieds pour avancer, et pour se mettre en équilibre, mais je n'ai jamais pu sçavoir comment ils les font jouer. Tout ce qu'il y'a de sûr, c'est qu'ils avancent très vite. Ils regardent en bas, et ont presque la même attitude que s'ils marchoient sur terre ferme.' Mais cette attitude est impossible à un homme qui ne s'est pas point exercé à la prendre, parce que les mouvements de l'eau, et l'incertitude de son corps, toujours vacillant dans un liquide, le tirent à tout moment de la direction verticale, et l'entraînent malgré lui en avant ou en arrière" (pp. 44, 45).

W. T. THISELTON DYER

Resonance of the Mouth Cavity

I HAVE not tried Mr. Naylor's experiment, but from the account which he gave of it I could not see that any novel fact was involved, nor do I now see that the fact of "the different rates of vibration being *already in the air*" alters materially the conditions of the case. Whether the sounds are produced by the clatter of wheels, the impact of the thumb-nail upon the teeth, or by the vibrating tongue of a jew's-harp, the part played by the mouth-cavity in selecting the notes of a tune is substantially the same. GEORGE J. ROMANES

Storage of Energy

LIKE many others, I have given much thought to the accumulation of force, and have felt much astonished at the account of Faure's battery, if it is to be so called, although of course such a development was to be expected from the time that Planté made his.

I see that men immediately rush to waterfalls, rivers, and tides to obtain the power for accumulation when they leave coal and wood; my ideas are rather in the direction of wind; and I have often pictured our country covered, like that around Zaandam, with windmills. The wind is not constant, but more so than most of our efficient streams, and it is found at every spot. The power is quite unlimited, and we can moderate the action of the machinery whenever we obtain the requisite force. Storage has hitherto been required. I have imagined our windmills pumping up water to great reservoirs, but we have not yet learned to make reservoirs for water except at an enormous expense and in unprotected valleys; other imaginings have come into many minds, but if we have a really true and safe storage, such as described, the wind will become our fire to warm us, our steam to drive us, our gas to light us, and our universal servant. The wind will drive our mills, too (except when a fog comes, lasting so long that our stores of power fail), with sufficient storage, inconstancy will cease to trouble us, whilst every valley may have its lights and every mountain-top its beacon, and darkness will scarcely trouble mankind in this new-coming world of light. We have heard of the golden servants of Vulcan and the mechanical slaves of the great Khan. What will be the result when every man has the wind at his command and the lightning at his service by friction, like Aladdin? It seems to me that the wind is the great power that we shall next use, and that Prince—the power of the air—shall be bound to serve us for at least a thousand years.

The Dutch have long made windmills, but when over in Holland a few years ago examining a little, I was unable to find the books wanted on the subject.

The fact that coal can be carried will not affect the question if wind is used. Wind carries itself. We shall seek our power from the heavens instead of the infernal pits, and a race of healthy, ruddy faces will take the place of the blackened and degraded countenances from mines.

I wish to show that we have excess of power in the wind. Will this new accumulator, of which I know nothing from personal experience, serve us to keep it? To keep it a few hours is a great point. Coal becomes secondary if we accumulate the force of the wind, and Niagara itself will be no longer wanted. Of course we need machines to use the wind-power. At present coals are cheaper with us; not so in all parts of Holland, and not so in many other places. However, here we have problems enough to solve; do not let us throw cold water on the discoveries of others, or show, as scientific men so often do, our own opinion to be dear beyond the truth among others.

R. A. S.

Explanation of the Female Dimorphism of Paltostoma torrentium

IN his paper on "*Paltostoma torrentium*, eine Mücke mit zweigestaltigen Weibchen" (*Kosmos*, vol. viii. pp. 37–42), my brother Fritz Müller supposes that this species of Blepharoceridæ originally was blood-sucking, but in later times changed its habits and became fond of flower-nectar. In the males, who need only little food, this change of habits and the corresponding change of the mouth-parts was accomplished, my brother supposes, more rapidly and perfectly than in the females, who, maturing eggs and passing the winter, stand in need of more albuminous food than the males do. Whilst therefore in some females of *Paltostoma torrentium* the same change of habits and mouth-parts has taken place as in the males, other females have still more or less continued their original blood-sucking habits and preserved their original blood-sucking instruments.

This explanation given by my brother is not yet proved by any direct observation of *Paltostoma's* habits. He mentions, as an indirect argument for his opinion, that in several Diptera the females have been stated to be blood-sucking, whilst the males take nectar of flowers. It may therefore be worth publishing, that in *Empis punctata* really just the same takes place as my brother's explanation of the female dimorphism in *Paltostoma torrentium* requires to be supposed: males who exclusively feed on flower-nectar, besides females, both enjoying flower-honey and attacking living animals and sucking their blood. Several weeks ago (May 26) a great many males as well as females of *Empis punctata* roved on the flowers of hawthorn (*Cratægus exyacantha*). The males were exclusively occupied with sucking nectar. Of the females some did the same, whilst others attacked, murdered, and consumed the most clever visitor of flowers among all our Syrphidæ, *Rhingia rostrata*.

HERMANN MÜLLER